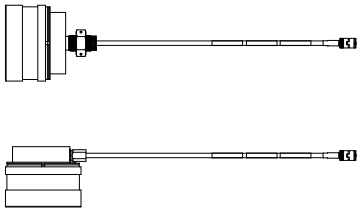
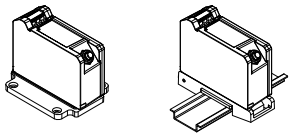
3300 XL 50 mm Proximity Transducer System

Bently Nevada* Asset Condition Monitoring





Description

The 3300 XL 50 mm Transducer System consists of a separate 50 mm probe, an extension cable, and a 3300 XL 50 mm Proximitor* Sensor. The large diameter coil gives this system a maximum linear range of 27.9 mm (1100 mils), the longest linear range of our eddy current transducer line. This linear range makes the 3300 XL 50mm Transducer System ideal for measuring the differential expansion (DE) or rotor expansion (RX) of large steam turbine generators that results from the difference in growth rates between the turbine rotor and the machine stator (casing).

Measuring Differential Expansion

The Differential Expansion measurement is made by using two proximity transducers that observe a collar or ramp some distance from the thrust bearing. Typical transducer mounting arrangements that require the 3300 XL 50 mm Transducer's long linear range include:

- Two transducers observing the same side of a collar.
- Two complementary input transducers observing opposite sides of a collar, effectively doubling the measurable DE range.

The criteria for selecting a mounting method are the size of the available target, the expected amount of rotor axial movement, and the type of DE target that exists in the machine. If the collar height is sufficient and the required total measurement range is less than 27.9 mm (1.1 inches), the preferred configuration for redundant measurements is to use two transducers observing the same side of a collar. When 28 mm to 56 mm (1.1 to 2.2 inches) of total range are required, install the transducers in a complementary fashion on opposite sides of the differential expansion collar or other target material.

System Compatibility

The 3300 XL 50 mm probe comes in three case & thread configurations to physically replace all standard 7200 50 mm systems (including side and rear exit probes). The standard 7200 style mounting brackets are still available as accessories. In addition, a new bracket to adapt the probe to the 50mm DE Integral transducer sliding mount base is also available. The Proximitor Sensor has a 0.394 V/mm (10 mV/mil) output that is identical to that of the 7200 and 50 mm DE Integral systems, which allows customers to upgrade without requiring any changes in the monitor configuration. When upgrading from previous systems, every transducer system component (probe, extension cable, and Proximitor Sensor) must be replaced with 3300 XL 50 mm components.

Proximity Probe and Extension Cable

The 3300 XL 50 mm probe is designed to survive the harshest steam turbine DE environments. It can continually operate and maintain its accuracy in high temperatures up to 200 °C (392 °F), and can withstand intermittent high temperatures up to 250 °C (482 °F). The 50 mm probe has both a front and rear seal which, combined with the High Temperature FluidLoc* cable (standard on all 50 mm probes), prevent moisture from entering the probe tip. Special high-temperature ClickLoc* connectors are also standard on the probe and extension cable. Each probe and cable come with connector protectors and a disposable connector protector installation tool to ensure that the connectors remain free of contamination. The ClickLoc connector on the probe lead features a removable collar that facilitates routing the cable through tight clearances.
The 3300 XL 50 mm probe is available in straight exit case styles with ½-20 English threads or M14x1.5 metric threads, including a locknut with predrilled safety wire holes. The side exit probe has two ¼-20 mounting holes in the rear of the probe case. For both straight exit and side exit probes the overall case diameter is 1.99 inches.

Proximitor Sensor

The 3300 XL 50 mm Proximitor Sensor[1] has the same advanced features as all 3300 XL Proximitor Sensors. Its thin design allows it to be mounted in either a high-density DIN-rail installation or a more traditional panel mount configuration. Improved RFI/EMI immunity allows the 3300 XL Proximitor Sensor to achieve European CE mark approvals without any special mounting considerations. This RFI immunity prevents the transducer system from being adversely affected by nearby high frequency radio signals. SpringLoc terminal strips on the Proximitor Sensor require no special installation tools and facilitate faster, highly robust field wiring connections.
Notes:

Proximitor Sensors are supplied by default from the factory calibrated to AISI 4140 steel. Calibration to other target materials is available upon request.

Mounting Accessories

The correct operation of the transducer system must be initially verified during installation and periodically thereafter. This is done by physically moving the transducer to simulate the motion of the shaft collar. This requires a mounting bracket that allows the transducer system to slide relative to the shaft rotor and collar.

An optional Sliding Bracket can be ordered for the 3300 XL 50 mm Transducer for both single transducer and complementary input applications. This mounting bracket allows you to verify the transducer system and gap the probes by sliding the transducer system through its linear range. The base plate of the sliding bracket is installed on the inner surface of the turbine case near the differential expansion collar. Probes are installed in the probe clamp that attaches to the sliding carriage. The sliding carriage slides onto and is secured to the base plate with bolts and safety wire. To verify and install the transducer, loosen the bolts securing the sliding carriage to the base plate and move the sliding carriage and probes. A verification kit with spindle micrometer can be temporarily secured to the base plate to provide a reference for axial verification measurements. The spindle micrometer measures the movement of the transducer system relative to the collar during these verification tests.

Specifications

Unless otherwise noted, the following specifications are for a 3300 XL 50 mm Proximitor Sensor, extension cable and probe between 0°C and +45°C (+32°F to +113°F), with a -24 Vdc power supply, a 10 kΩ load, a Bently Nevada supplied AISI 4140 steel target that is 102 mm (4.0 in) diameter or larger. The system accuracy and interchangeability specifications do not apply when using a transducer system calibrated to any target other than a Bently Nevada AISI 4140 steel target.

Electrical

Proximitor Sensor Input

Accepts one noncontacting 3300 XL 50 mm Proximity Probe and Extension Cable.

Power

Requires -17.5 Vdc to -26 Vdc without barriers at 12 mA maximum consumption, -23 Vdc to -26 Vdc with barriers. Operation at a more positive voltage than -23.5 Vdc can result in reduced linear range.

Output resistance

50 Ω

Extension cable capacitance:

69.9 pF/m (21.3 pF/ft) typical

Field wiring:

0.2 to 1.5 mm^2 (16 to 24 AWG) Recommend using three-conductor shielded triad cable.

Linear Range:

27.9 mm (1100 mils). Linear range begins at approximately 1.3 mm (50 mils) from target and is from 1.3 to 29.2 mm (50 to 1150 mils) (approximately –1.5 to –12.5 Vdc).

Average Scale Factor (ASF)

394 mV/mm (10 mV/mil) nominal

Deviation from best fit straight line (DSL)

Less than ±0.74 mm (±29 mils)

System performance over extended temperatures:

Over a probe temperature range of -35°C to +120°C (-31°F to +248°F) with the Proximitor Sensor and extension cable between 0°C to +45°C (+32°F to +113°F), the DSL remains within ±2.03 mm (±80 mils).

Over a Proximitor Sensor and extension cable temperature range of -35°C to +65°C (-31°F to +149°F) with the probe between 0°C to +45°C (+32°F to +113°F), the DSL remains within ±2.03 mm (±80 mils).

Recommended Minimum Target Size:

102 mm (4.0 in) diameter (flat target)

Electrical Classification:

Complies with the European CE mark.

Hazardous Area Approvals

NOTE
Multiple approvals for hazardous areas certified by Canadian Standards Association (C/US) in North America and by Baseefa in Europe.

North America

Division 1 (Intrinsically safe):

Ex ia IIC T4/T5; Class I Zone 0 or Class 1 Division 1; Groups A, B, C, and D, when installed with intrinsically safe

zener barriers per drawing 141092 or when installed with galvanic isolators.

Division 2 (non-incendive):

Ex nA IIC T4/T5 Class I Zone 2 or Class I, Division 2, Groups A, B, C, and D when installed without barriers per drawing 140979.

T5 @ Ta = -35 °C to +85 °C.

T4 @ Ta = -51 °C to +100 °C.

Europe

3300 XL 50 mm
Proximitor Sensor, ia:

II 1 G EEx ia IIC T4/T5. Approved when installed per drawing 141092.

3300 XL 50 mm
Proximitor Sensor, nA:

II 3 G Ex nA II T4/T5. Approved when installed per drawing 140979.

T5 @ Ta = -35 °C to +85 °C.

T4 @ Ta = -51 °C to +100 °C.

3300 XL 50 mm probe, ia:

II 1 G EEX ia IIC, Temperature Classification per Table 0-1.

3300 XL 50 mm probe, nA:

II 3 G EEX nA II, Temperature Classification per Table 0-1.

IEC Ex

3300 XL 50 mm Proximitor Sensor, ia

Ex ia IIC T4 (-51ºC ≤ Ta ≤ +100ºC) / T5 (-35ºC ≤ Ta ≤ +85ºC)

Load Parameters

The capacitance and either the inductance or the inductance to resistance (L/R) ratio of the load connected to the probe coaxial terminal, must not exceed the values in the table listed below.

Type Approval:	Gas Group	Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
ATEX and IEC Zone 0/1	IIC	0.078	0.99	29.2
	IIB	0.645	7.41	117.0
	IIA	2.144	15.6	234.0
CSA Div 1	A and B	0.070	1.0	29.2
	C	0.600	5.0	117.0
	D	2.09	11.0	234.0
CSA Div 2	All	0.460	100.0	N/A

3300 XL 50 mm
Proximitor Sensor, nA

Ex nA II T4 (-51ºC ≤ Ta ≤ +100ºC) / T5 (-35ºC ≤ Ta ≤ +85ºC)

3300 XL 50 mm
Eddy Current Probes, ia

Ex ia IIC Temperature Classification per Table 0-1.

3300 XL 50 mm
Eddy Current Probes, nA

Ex nA II for Zone 2, Temperature Classification per Table 0-1.

Table 0-1: Probe Ex ia and Ex nA Temperature Classification

Temperature Classification	Ambient Temperature (Probe Only)
T1	-51ºC to +232ºC
T2	-51ºC to +177ºC
T3	-51ºC to +120ºC
T4	-51ºC to +80ºC
T5	-51ºC to +40ºC

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Mechanical

Probe Tip Material:

Polyphenylene Sulfide (PPS).

Probe Case Material:

AISI 304 stainless steel (SST).

Probe Cable Specifications:

75 Ω triaxial, perfluoroalkoxyethylene (PFA) insulated FluidLoc probe cable in the following total probe lengths: 1, 5 or 9 metres.

Extension Cable Material:

75 Ω triaxial, perfluoroalkoxyethylene (PFA) insulated FluidLoc cable.

Proximitor Sensor Material:

A380 aluminum

Sliding Bracket Material:

Anodized aluminum and stainless steel

System Length:

5 or 9 metres including extension cable

Probe and Extension Cable Armor (optional):

Flexible SST with PFA outer jacket.

Tensile Strength (maximum rated):

330 N (75 pounds) probe case to probe lead. 270 N (60 pounds) at probe lead to extension cable connectors.

Connector material:

Gold-plated brass and gold-plated beryllium copper

Torque Specifications

Description	Maximum Rated
All threaded probe cases	45 N•m (400 in•lbf)
M5x.8 sliding bracket cap screws	9.6 N•m (85 in•lbf)

Connector-to-connector torque

Recommended torque:

Finger tight

Maximum torque:

0.565 N•m (5 in•lb)

Minimum Bend Radius (with or without sst armor):

25.4 mm (1.0 in)

Environmental Limits

Probe Temperature Range

Operating and Storage Temperature:

-35°C to +200°C (-31°F to +392°F)

Short-term Operating and Storage Temperature:

+250°C (+482°F) for less than 24 hours.

Extension Cable Temperature Range

Operating and Storage Temperature:

-51°C to +200°C (-31°F to +392°F)

Proximitor Sensor Temperature Range

Operating Temperature:

-51°C to +100°C (-60°F to +212°F)

Storage Temperature:

-51°C to +105°C (-60°F to +221°F)

Sliding Bracket Temperature Range

Operating and Storage Temperature:

-35°C to +200°C (-31°F to +392°F)

Relative Humidity:

Less than a 3% change in Average Scale Factor (ASF) when tested in accordance with IEC standard 68-2-66.

Probe Pressure:

3300 XL probes are designed to seal differential pressure between the probe tip and case. The probe is sealed with Viton® O-rings. Probes are not pressure tested prior to shipment. Contact our custom design department if you require a test of the pressure seal for your application

Note: It is the responsibility of the customer or user to ensure that all liquids and gases are contained and safely controlled should leakage occur from a proximity probe. In addition, solutions with high or low pH values may erode the tip assembly of the probe causing media leakage into surrounding areas. Bently Nevada will not be held responsible for any damages resulting from leaking 3300 XL proximity probes. In addition, 3300 XL proximity probes will not be replaced under the service plan due to probe leakage.

Patents:

5,685,884

6,293,005

6,643,909

7,239,133

Components or procedures described in these patents apply to this product.

Ordering Information

3300 XL 50 mm Proximity Probe:

330876-AXX-BXX-CXX-DXX

A: Probe Case Type Option
- **0 1** ½-20 Thread – Straight Exit
- **0 2** M14x1.5 Thread – Straight Exit
- **0 3** Smooth 1.99 in dia - Side Exit

B: Total Length Option
- **1 0** 1.0 metre (3.3 feet)
- **5 0** 5.0 metres (16.4 feet)
- **9 0** 9.0 metres (29.5 feet)

C: Armor Option
- **0 0** High Temperature FluidLoc Cable
- **0 1** High Temperature FluidLoc Cable with Armor

D: Agency Approval Option
- **0 0** No Approvals
- **0 5** Multiple Approvals

3300 XL 50 mm Proximitor Sensor

330878-AXX-BXX

A: Total Length and Mounting Option
- **5 0** 5.0 metres (16.4 feet) system length, panel mount
- **5 1** 5.0 metres (16.4 feet) system length, DIN mount
- **9 0** 9.0 metres (29.5 feet) system length, panel mount
- **9 1** 9.0 metres (29.5 feet) system length, DIN mount

B: Agency Approval Option
- **0 0** No Approvals
- **0 5** Multiple Approvals

3300 XL 50 mm Extension Cable

330877-AXXX-BXX-CXX

Note: Make sure that the extension cable length and the probe length, when added together, equal the Proximitor® Sensor total length.

A: Cable Length Option
- **0 4 0** 4.0 metres (13.1 feet)
- **0 8 0** 8.0 metres (26.2 feet)

B: Armor and Cable Option
- **3 6** FluidLoc ext. cable
- **3 7** FluidLoc ext. cable w/ armor

C: Agency Approval Option

0 0 No Approvals

0 5 Multiple Approvals

Mounting Brackets

Each Sliding Mounting Bracket comes with

- One sliding plate
- One base plate
- Sliding plate securing bolts with safety wire holes
- Lock washers

The material used for the mounting brackets is T6061-T6 aluminum. Base plate securing bolts are not provided; recommended bolt size is 3/8in or M8 socket head bolts.

3300 XL 50 mm Sliding Probe Bracket and Clamp:

330879-AXX-BXX

A: Probe Clamp Style

0 1 Left Exit

0 2 Right Exit

0 3 Two clamps (used for CIDE applications)[1]

B: DE Mounting Bracket

0 0 No Mounting Bracket; Clamp Only

0 1 Single DE Mounting Bracket[2]

0 2 Short CIDE Mounting Bracket[3]

0 3 Long CIDE Mounting Bracket[3]

This bracket is recommended for most installations. While any probe may be used, the smooth side exit probe is most often used with this bracket.

1. When ordering two clamps, one right exit and one left exit clamp will be provided so that the cables exit from the same side of the CIDE bracket.
2. The B01 probe mounting bracket option is only available with the A01 or A02 probe clamp style options.
3. The B02 and B03 probe mounting bracket options are only available with the A03 probe clamp style options.
4. When replacing 50mm DE 130713, part number 330879-AA-**00** should be ordered. Ordering with BB=00 will prevent unnecessary parts from being ordered with the clamp.

Sliding Mounting Brackets without clamps

131071-01

Single Transducer Mounting Bracket

131030-01

Short Complementary Input Differential Expansion (CIDE) Mounting Bracket

131031-01

Long Complementary Input Differential Expansion (CIDE) Mounting Bracket

Non-sliding Mounting Brackets

167285

Kit, 50 mm Clamp Mount (used with smooth-case side exit or threaded straight exit probes).

167286

Kit, 50 mm Bolt Mount (used only with smooth-case side exit probes).

132327-01

50mm DE Transducer Bracket (can be used with 330879 Probe Clamp if vertical sliding clamp is not desired).

Verification Kits

Each verification kit comes with:

- a verification kit bracket
- a spindle micrometer with either 0 to 2 in or 0 to 50 mm range
- two set screws
- a bracket securing bolt

The material used for the verification kit bracket is T6061-T6 aluminum.

131036-01

Verification Kit, Spindle Micrometer with English Units

131036-02

Verification Kit, Spindle Micrometer with Metric Units

Accessories

173959

Manual

148722-01

3300 XL Test Plug. The 3300 XL Test Plug has three self-contained test pins attached to three color-coded wires 1 metre in length, each terminated in a banana plug. The three-pin adapter plugs into the test pin holes on 3300 XL-style Proximitor Sensors. It is used to check the performance of the Proximitor Sensor from the test pin holes in the terminal strip without requiring the removal of the field wiring.

Extended Range Micrometer Kit

The extended range micrometer kit contains a precision micrometer and a 100 mm (4 inch) AISI 4140 target and is intended for acceptance testing of Bently Nevada extended range transducers. Bracket options are available to hold 8mm – 50mm probes as well as the 50 mm Integral DE transducer.

330187-AXX-BXX

A: Probe options

- **0 1** 8 mm to 50 mm probe threaded or smooth cases
- **0 3** 8 mm to 50 mm probe threaded or smooth cases and an adapter for 50 mm Integral DE probes

B: Micrometer Option

- **0 1** Standard English 0-2 inch micrometer
- **0 2** Standard metric 0-50 mm micrometer

02120015

Bulk field wire. 1.0 mm^2 (18 AWG), 3 conductor, twisted, shielded cable with drain wire. Specify length in feet.

02173009

Bulk field wire. 1.0 mm^2 (18 AWG), 3 conductor, twisted, shielded cable. Specify length in feet.

138492-01

Replacement panel-mount mounting pad

138493-01

Replacement DIN-mount mounting pad

04310310

3300 XL Proximitor Sensor Panel-mount Screws. Package includes four 6-32 UNC thread forming mounting screws (Supplied standard with 3300 XL Proximitor Housings [3300 XL option]).

03200006

Silicone self-fusing tape. A 9.1 metre (10 yard) roll of silicone tape to protect connectors. It is easy to install and provides excellent electrical isolation and protection from the environment. It is not recommended for use inside the casing of the machine.

40180-02

Connector Protectors. Package contains 10 pairs of connector protectors.

03839410

Male Connector Protector. Placed on the extension cable to connect to the female connector protector on the probe and provide environmental protection of connectors.

03839420

Female Connector Protector. Placed on the probe lead to connect to the male connector protector on the extension cable and provide environmental protection of connectors. Also placed on the extension cable to slide over the Proximitor Sensor connection and protect it from the environment.

330153-10

3300 XL 50 mm Connector Kit. Used on 3300 XL 50 mm probes and extension cables. Contains one male (removable nut) and female ClickLoc connectors, color-coded sleeves and two pieces slit PFA tubing.

163356

Connector Crimp Tool Kit. Includes one set of multi-connector inserts and connector installation instructions. Supplied with carrying case.

173873

High Temperature Cable Zip-Ties. PEEK® cable tie is rated for use up to 200 C continuous temperature. Available in bags of 50 zip ties.

174804-01

Side Exit Probe Adapter Kit. Used to adapt side exit probes for the 330187 Extended Range Verification Kit.

Graphs and Dimensional Drawings

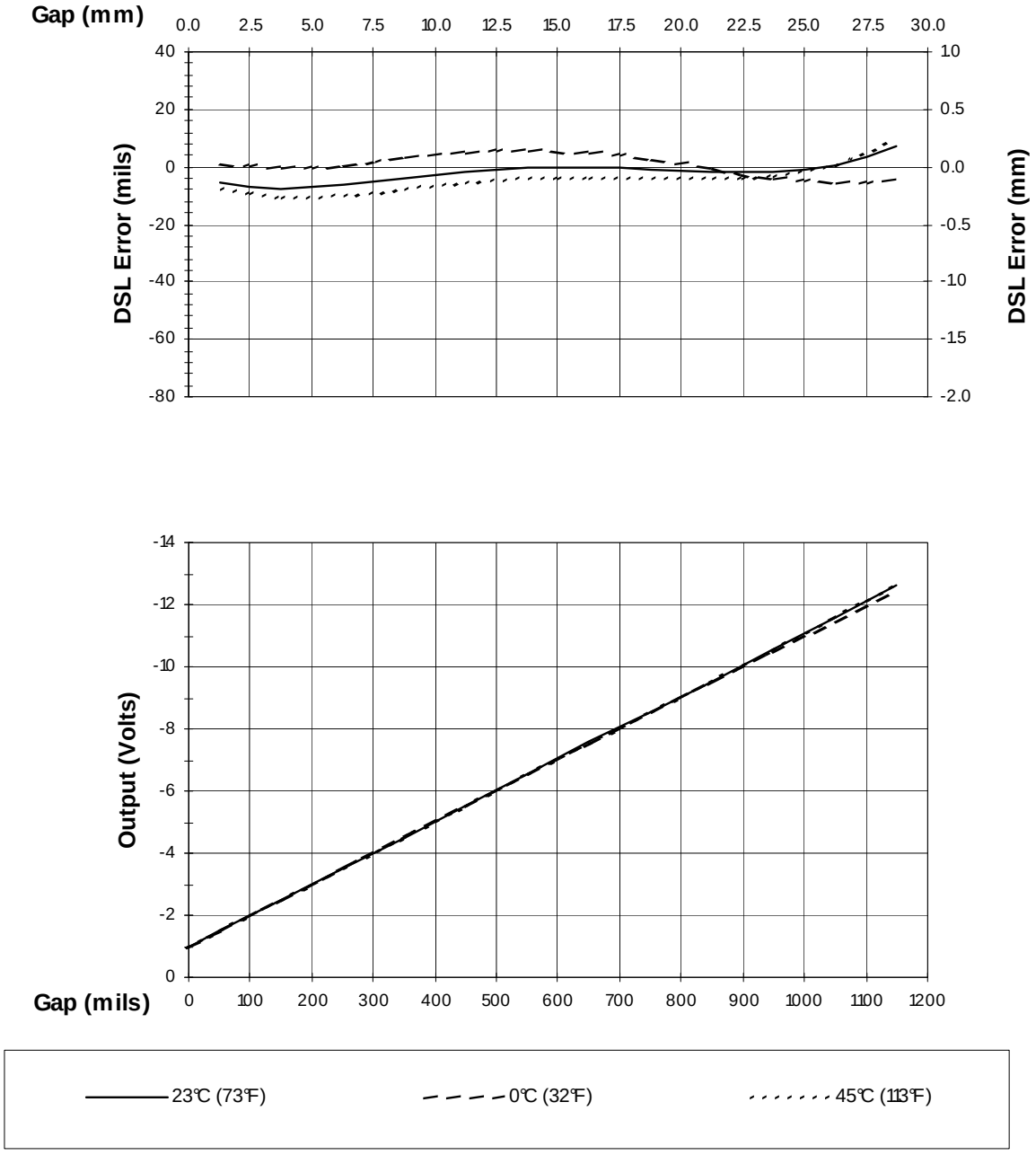


Figure 1 Typical 3300 XL 50 mm 5 m System Over Ambient Testing Range

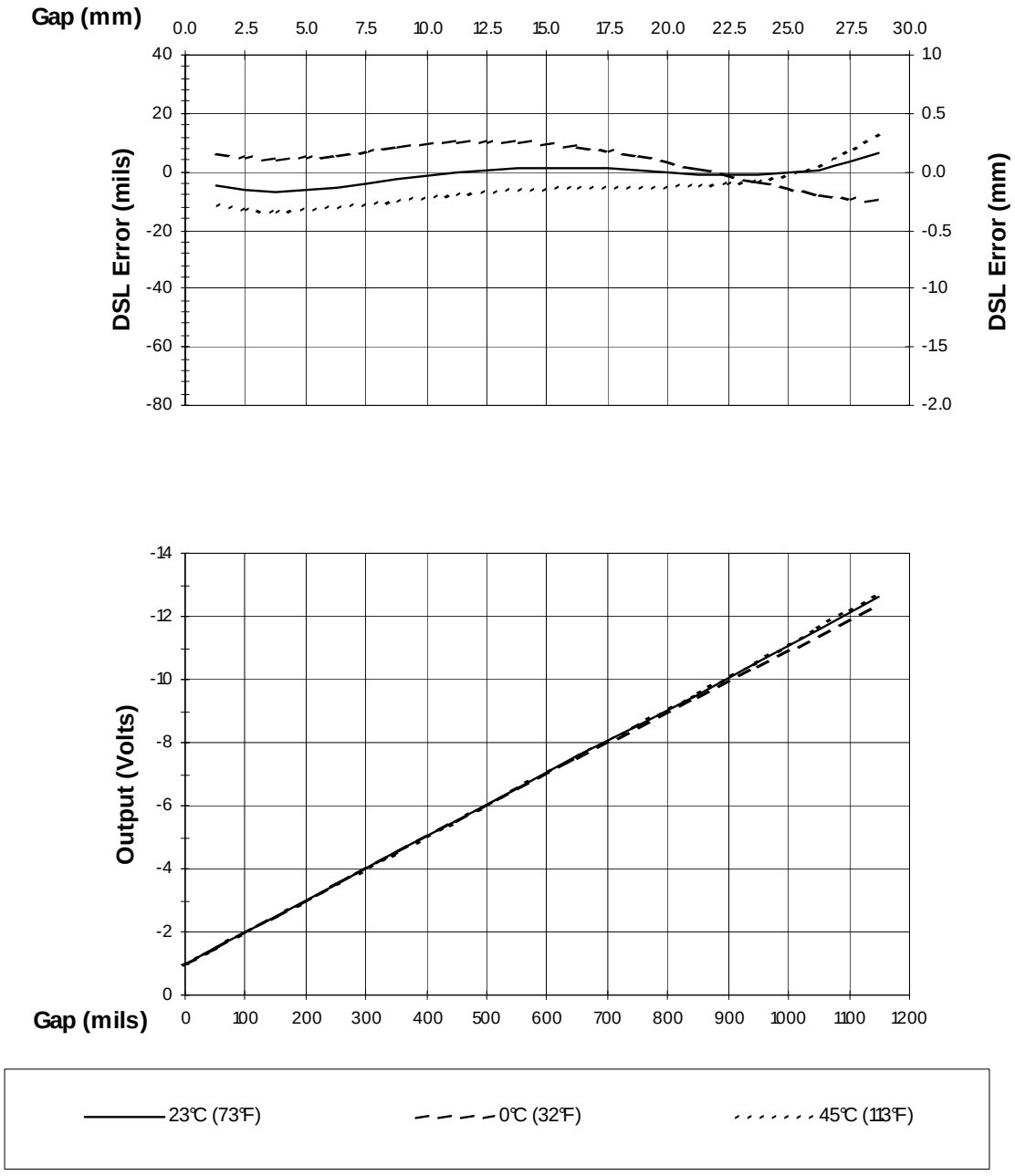


Figure 2 Typical 3300 XL 50 mm 9 m System Over Ambient Testing Range

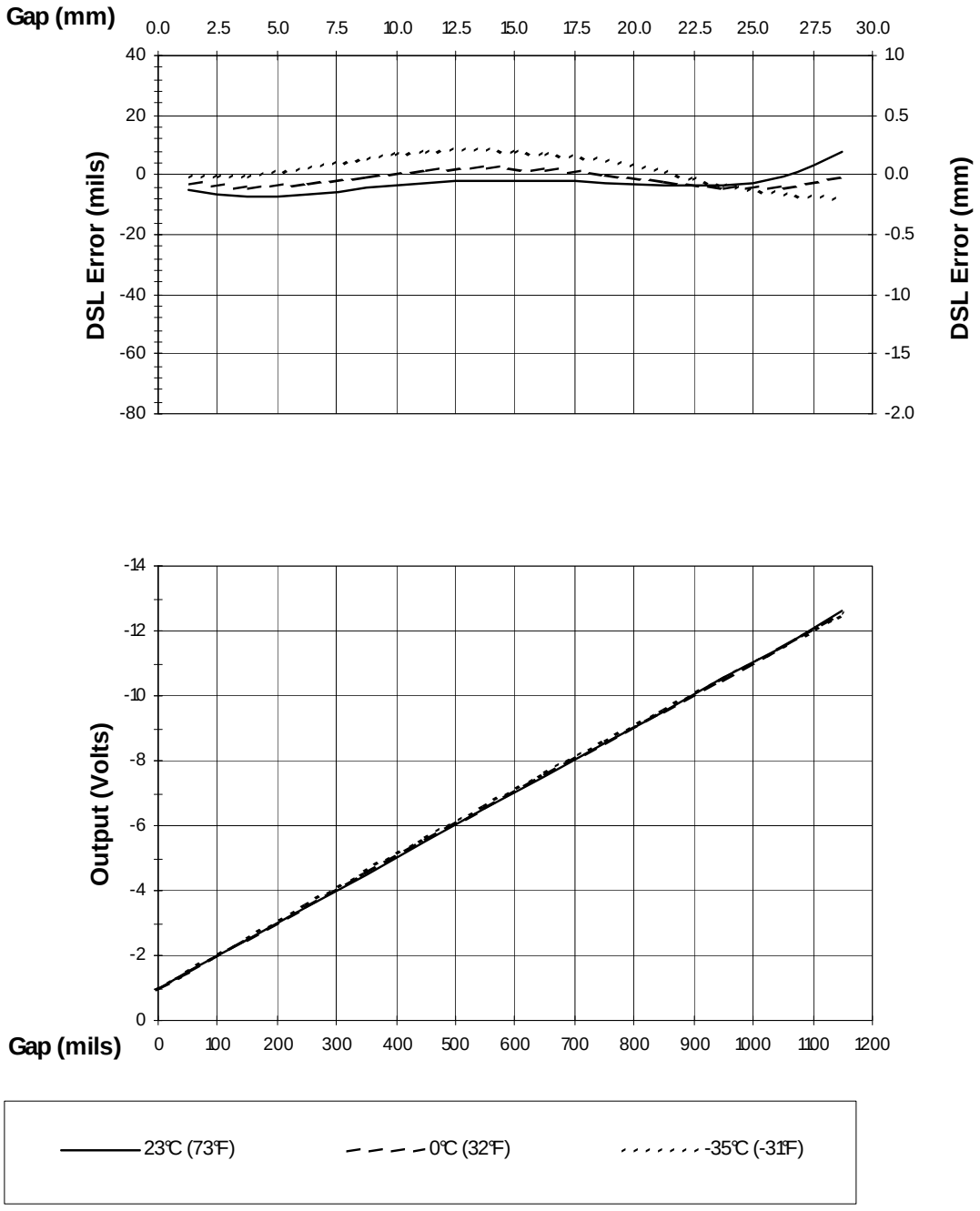


Figure 3 Typical 3300 XL 50 mm Probe + 1m Cable @ Low Temperature (Proximitor Sensor + 8m of Extension Cable @ 25 °C)

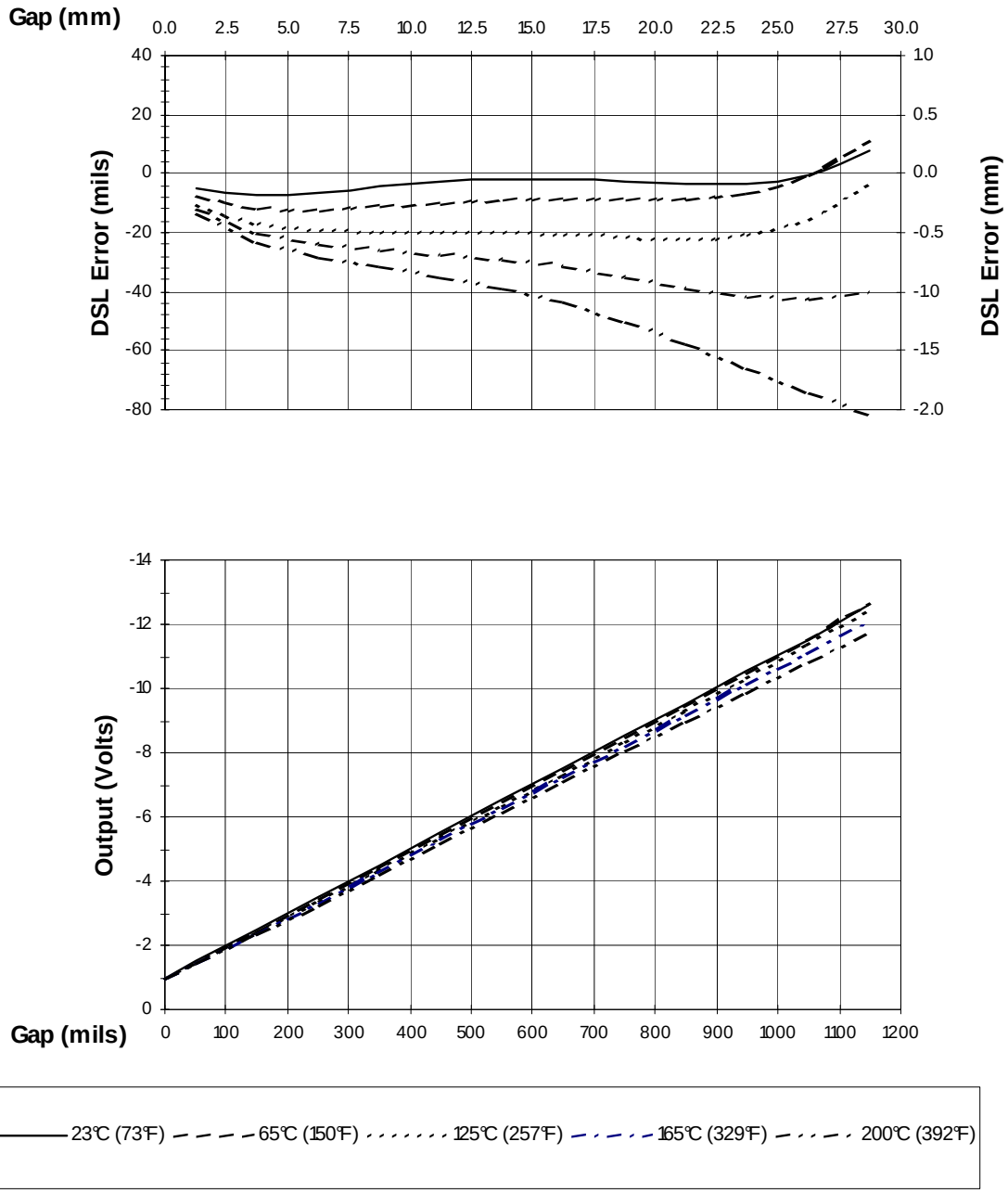


Figure 4 Typical 3300 XL 50 mm Probe + 1m Cable @ High Temperature (Proximitor Sensor + 8m of Extension Cable @ 25 °C)

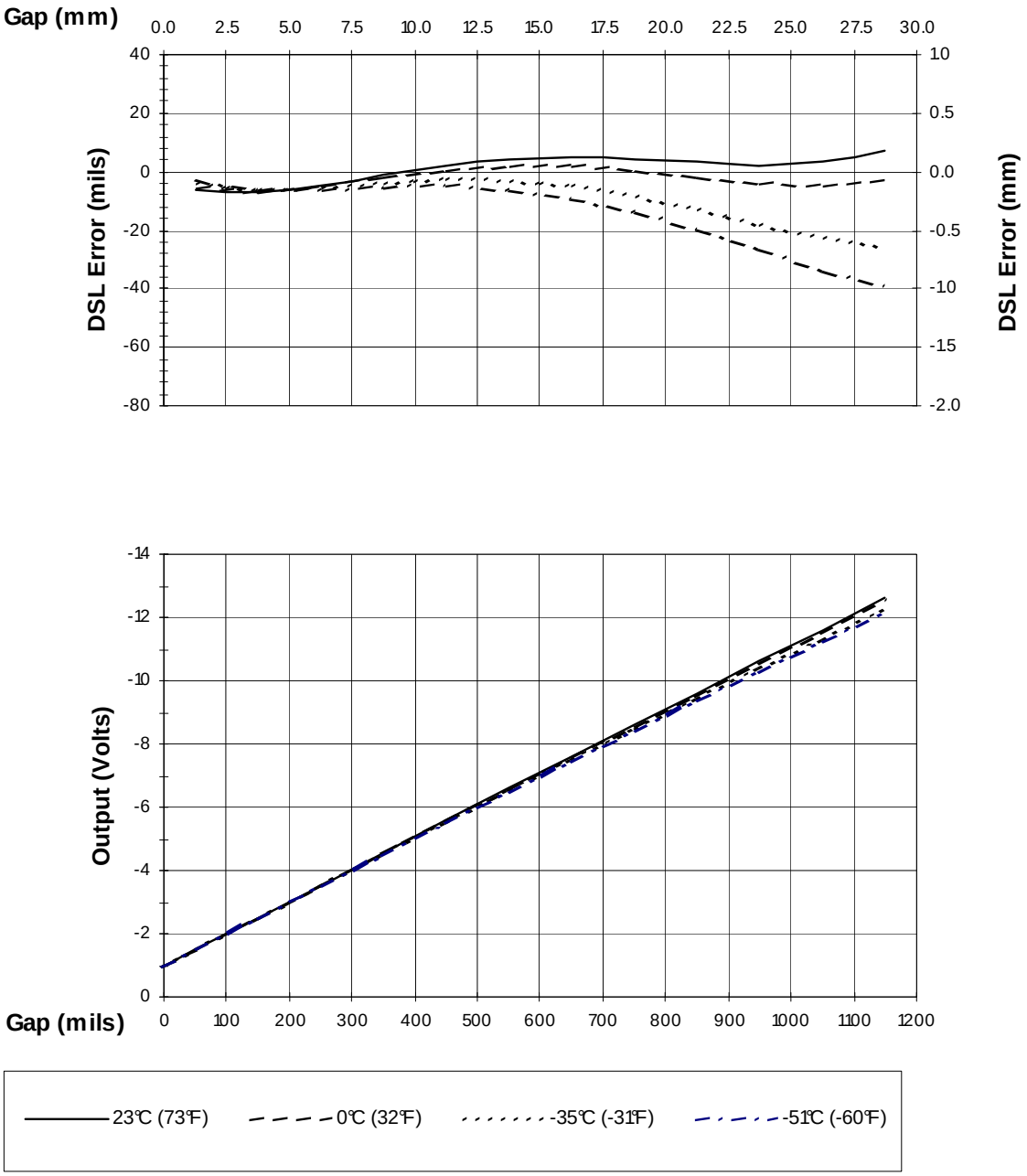


Figure 5 Typical 3300 XL 50 mm 5 m Proximitor Sensor with 4 m of Extension Cable @ Cold Temperature (Probe is at 25°C)

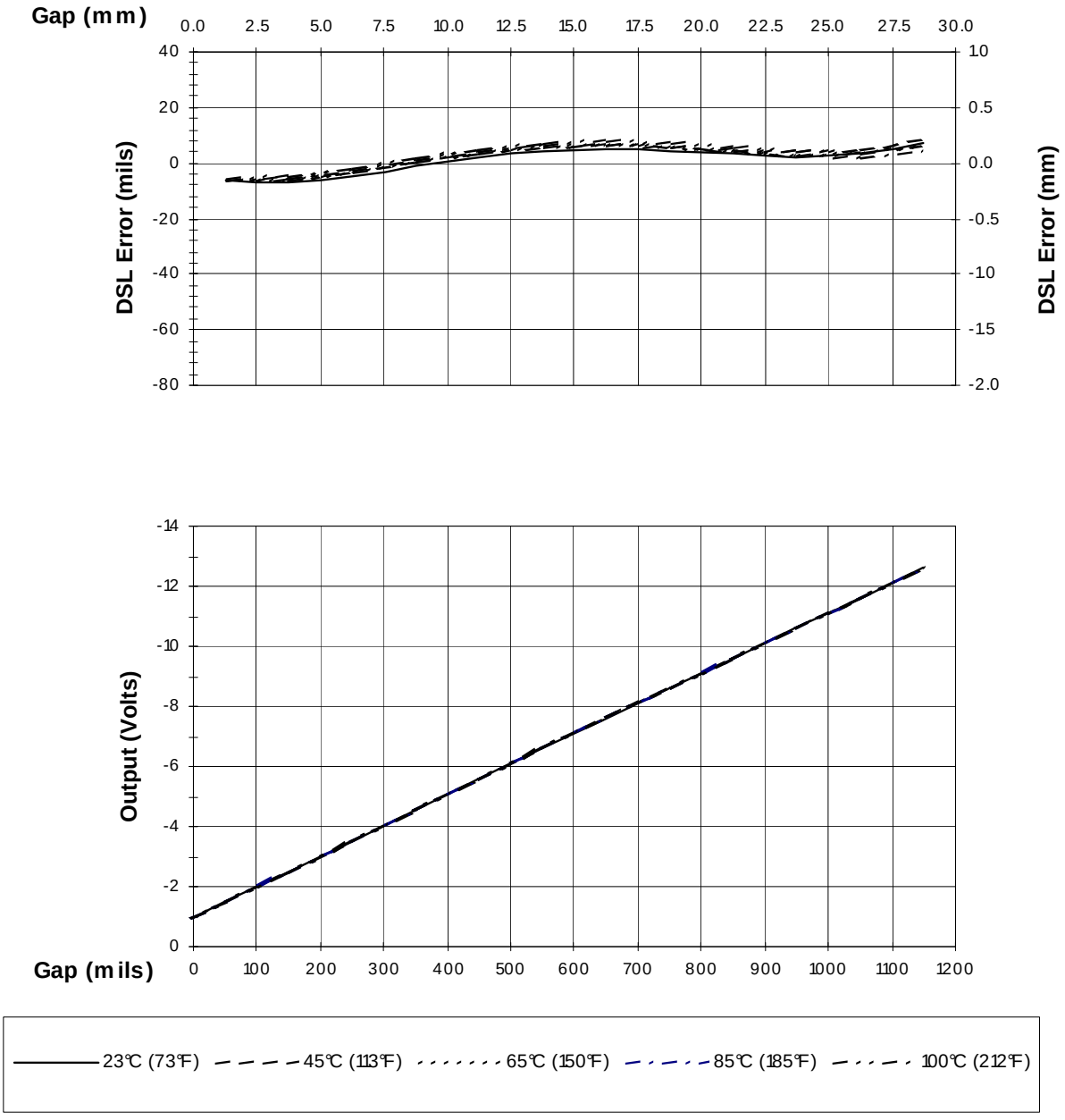


Figure 6 Typical 3300 XL 50 mm 5 m Proximitor Sensor with 4 m Extension Cable @ High Temperature (Probe is at 25°C)

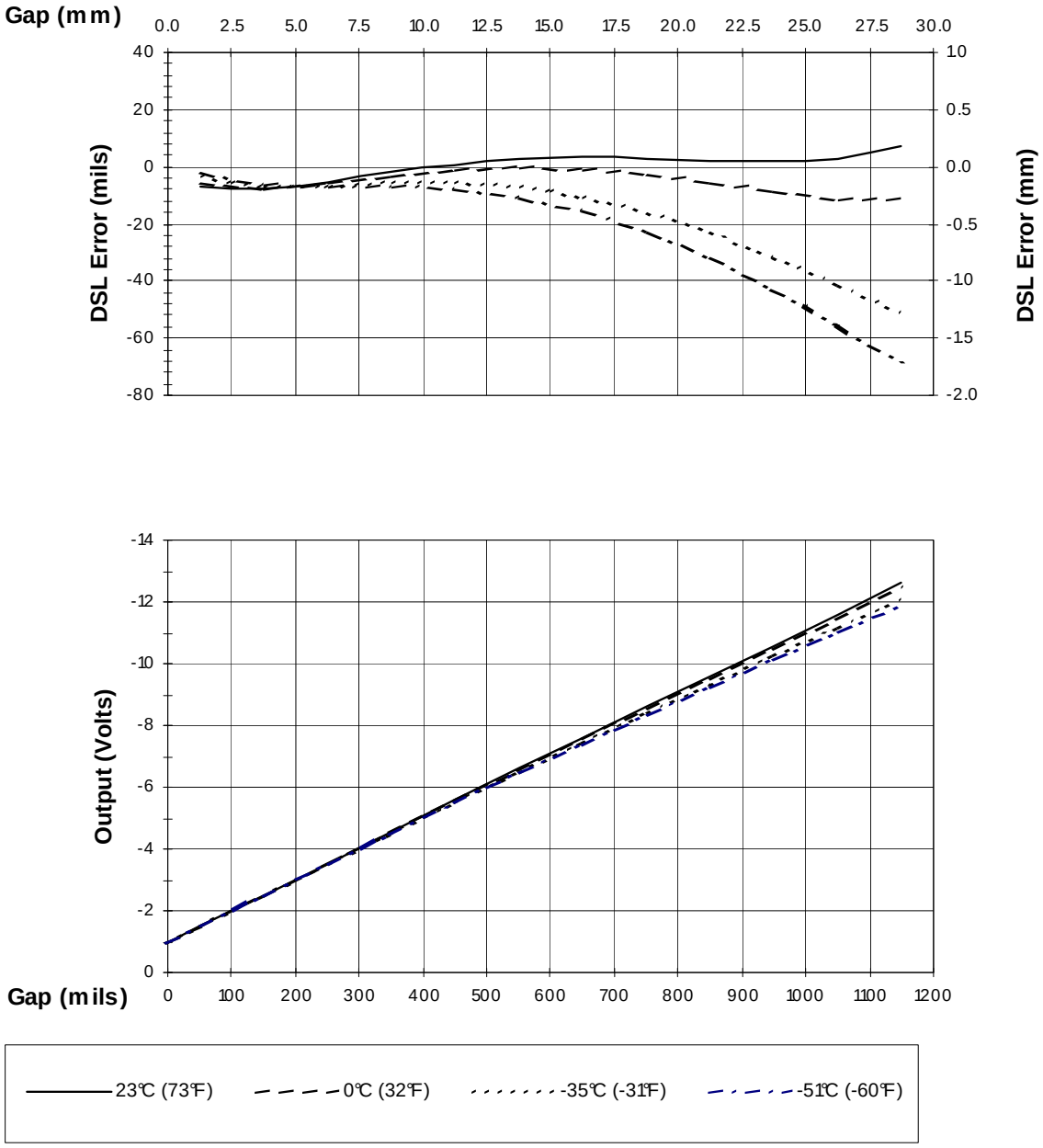


Figure 7 Typical 3300 XL 50 mm 9 m Proximitor Sensor with 8 m of Extension Cable @ Low Temperature (Probe is at 25°C)

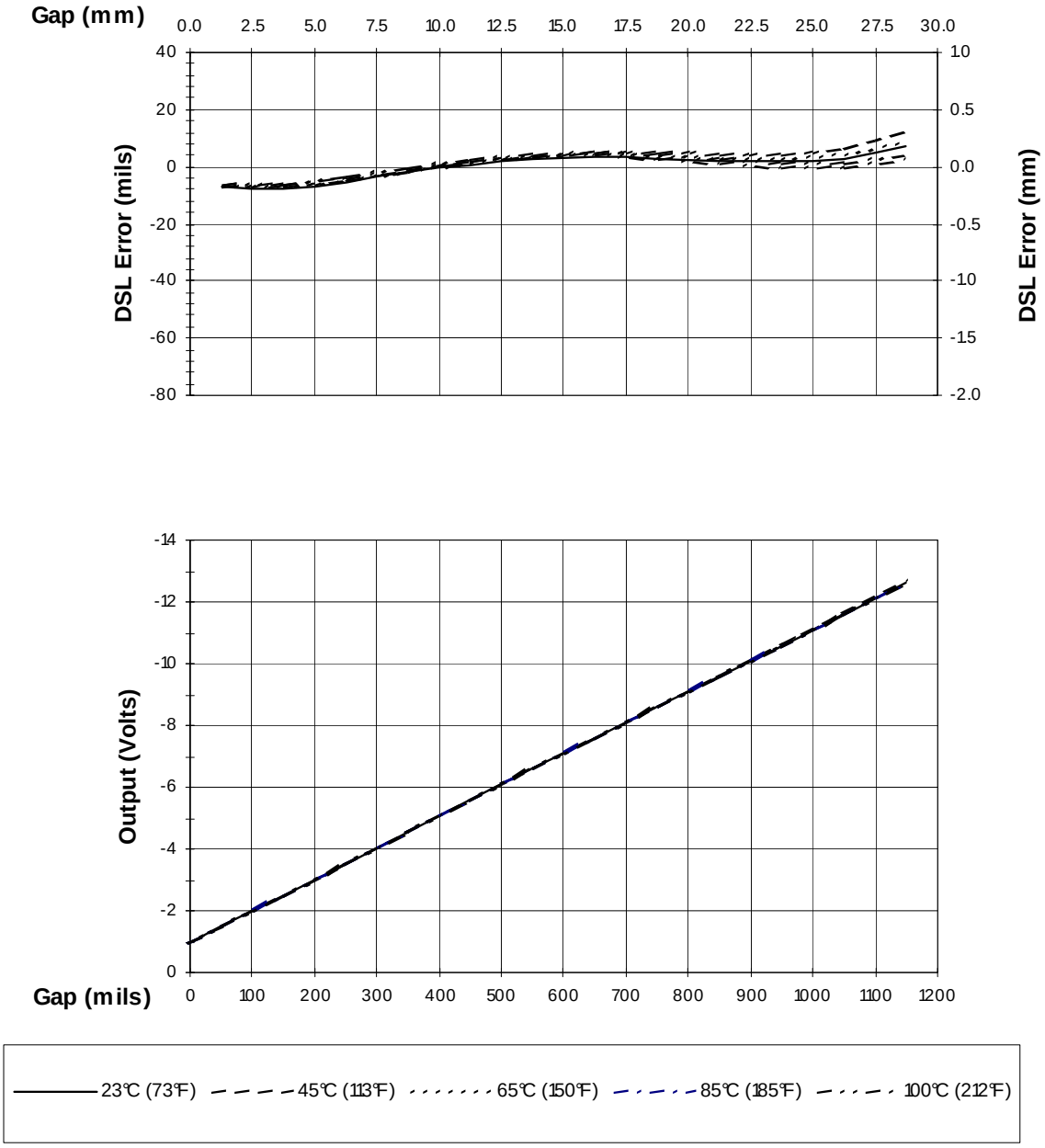
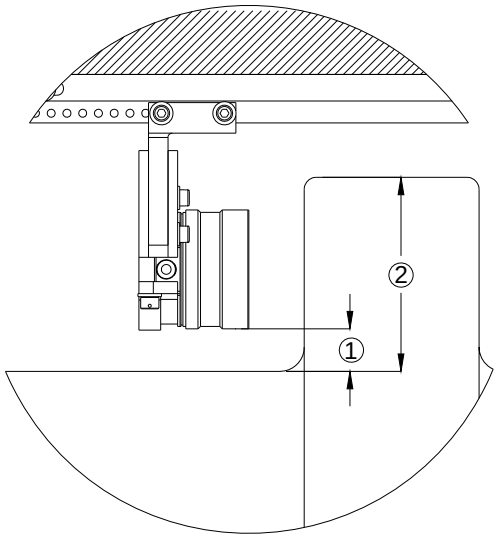


Figure 8 Typical 3300 XL 50 mm 9 m Proximitor with 8 m of Extension Cable @ High Temperature (Probe is at 25°C.)



(1) Shaft to side of probe distance.
(2) Collar Height.

Probe Position vs. Collar Height
Shaft to Side of Probe

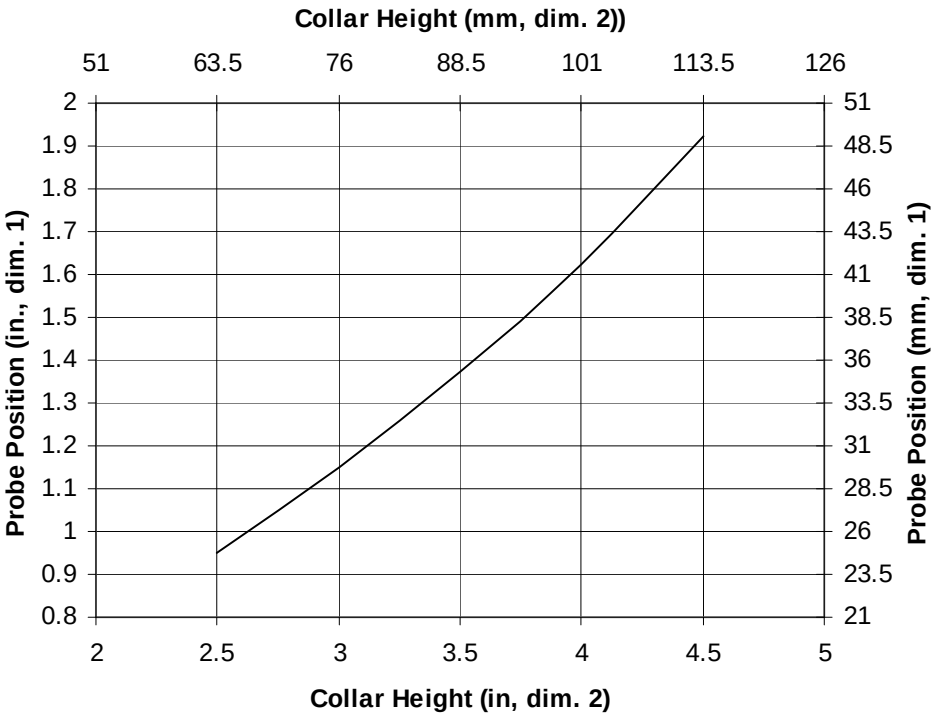
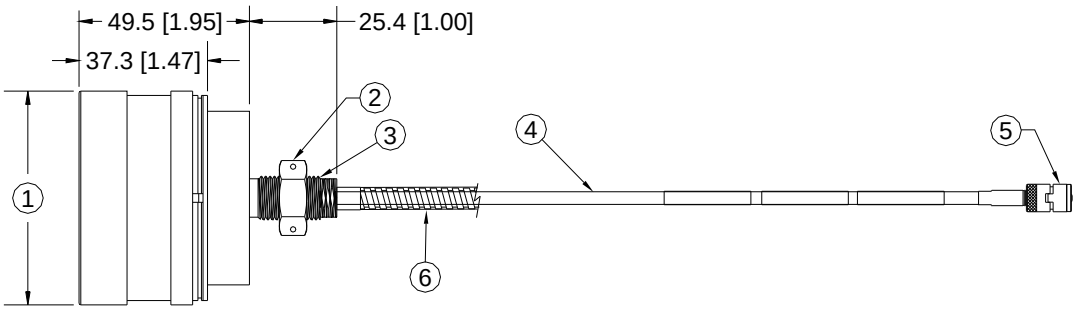
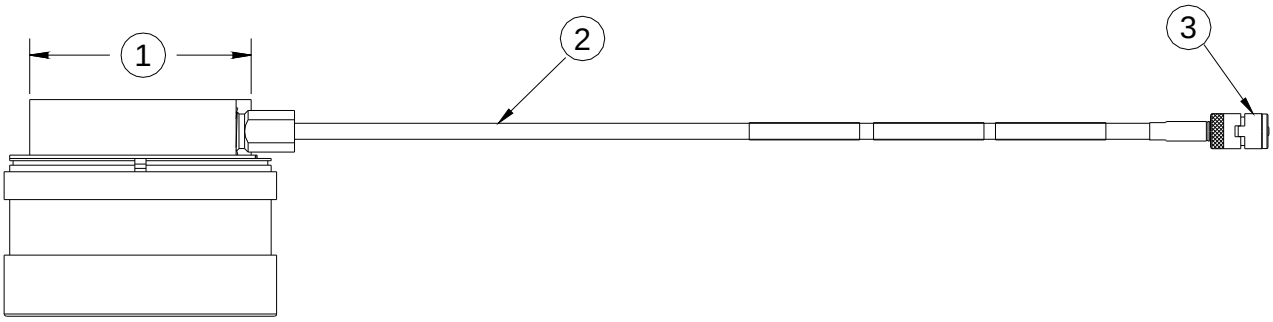


Figure 9 Recommended Probe Position Based on Collar Height



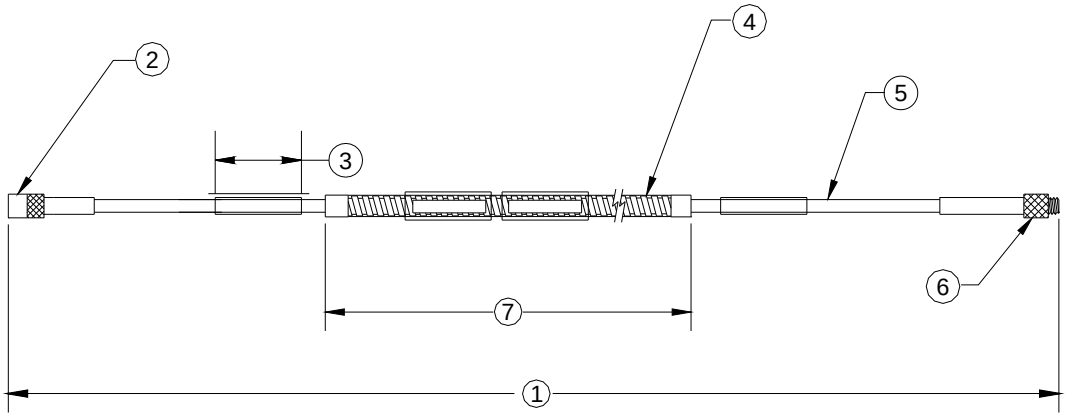
1. 62.2 mm (2.45 in) maximum diameter
2. 3/4-in or 21 mm diameter jam nut with safety wire holes
3. Case thread
4. FluidLoc coaxial cable with PFA Jacket, 3.94 mm (0.155 in) maximum diameter.
5. Miniature male coaxial connector, 8.0 mm (0.32 in) maximum diameter.
6. Optional Stainless steel armor with PFA jacket, 9.58 mm (0.377 in) maximum diameter; 12.7 mm (0.50 in) maximum diameter of armored ferrule.

Figure 10 330876, 3300 XL 50 mm Proximity Probe, Straight Exit



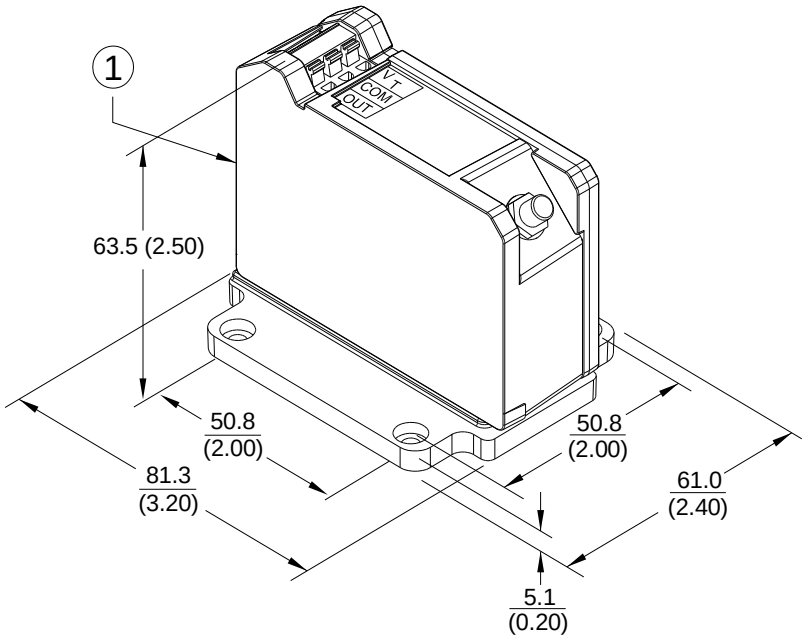
1. 50.5 mm (1.99 in) diameter
2. FluidLoc coaxial cable with PFA Jacket, 3.94 mm (0.155 in) maximum diameter.
3. Miniature male coaxial connector, 8.0 mm (0.32 in) maximum diameter.

Figure 11 330876, 3300 XL 50 mm Proximity Probe, Smooth 1.99 Inch Dia. Side Exit Case



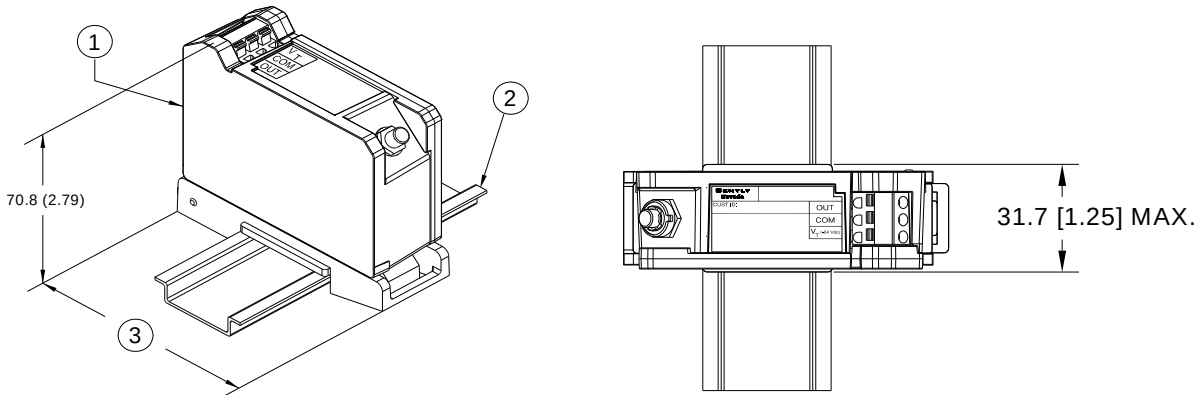
1. Cable length +20%, -0%
2. Miniature male coaxial connector, 7.2 mm (0.29 in) maximum diameter
3. Customer shrink tubing, 84 mm (3.3 in), 2 places
4. Optional stainless steel armor with PFA jacket, 7.65 mm (0.301 in) maximum diameter; 10.12 mm (0.0400 in) maximum diameter of armored ferrule.
5. FluidLoc coaxial cable with PFA Jacket, 3.94 mm (0.155 in) maximum diameter
6. Miniature female coaxial connector, 7.24 mm (0.285 in) maximum diameter
7. Armor Length = Cable Length – 300 mm (11.8 in)

Figure 12 330877, 3300 XL 50 mm Extension Cable



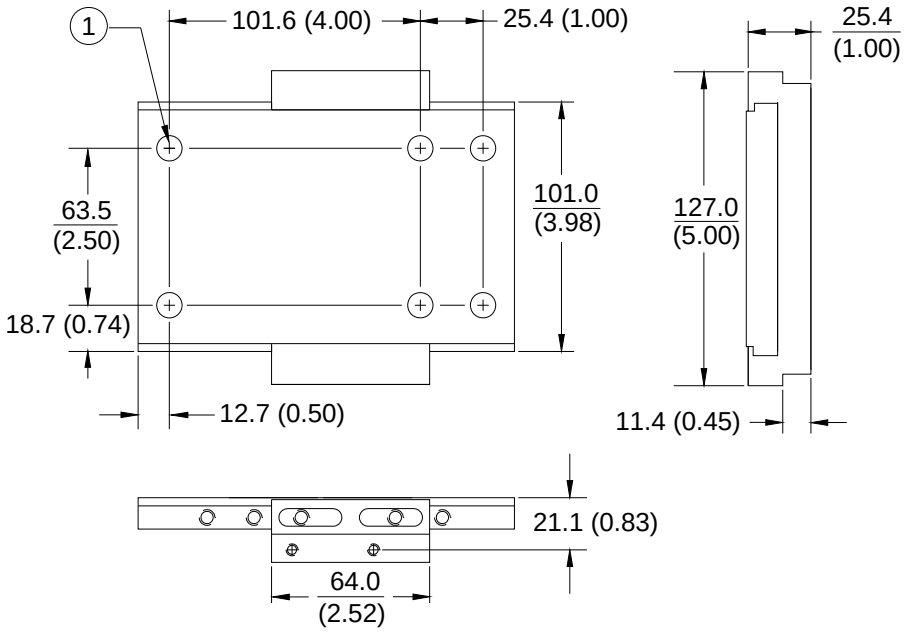
Mounting Option "A" –50 or -90

Figure 13 330878 Panel Mount 3300 XL 50 mm Proximitor Sensor



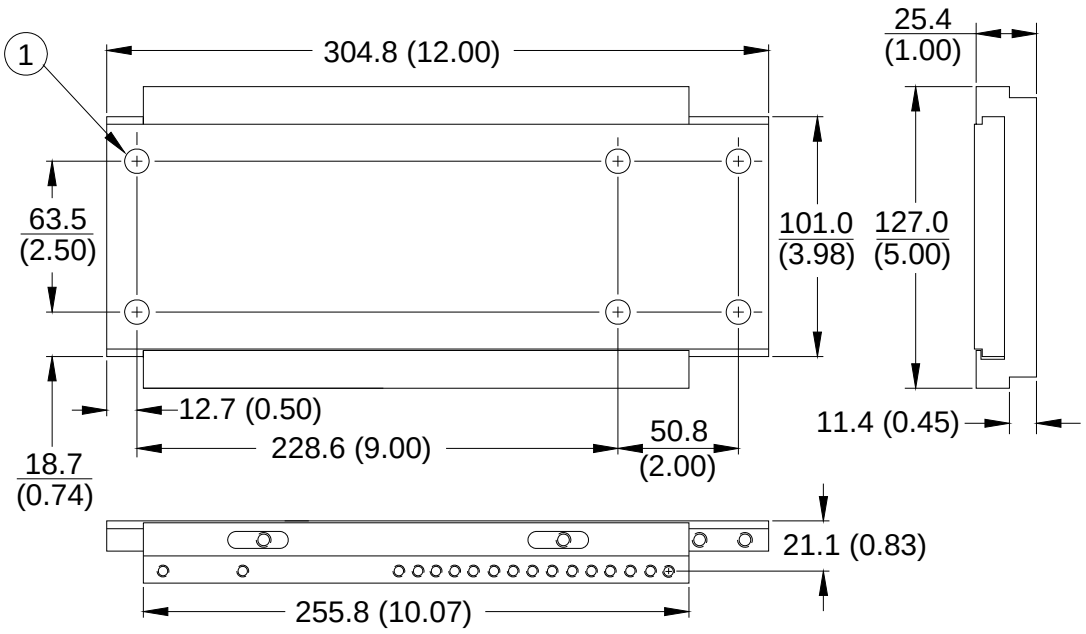
1. Mounting option "A" –51 or –91
2. 35mm DIN rail (not included)
3. 89.4 mm (3.52 in) (additional 3.05 mm (0.120 in) required to remove DIN rail)

Figure 14 330878 DIN Mount 3300 XL 50 mm Proximitor Sensor



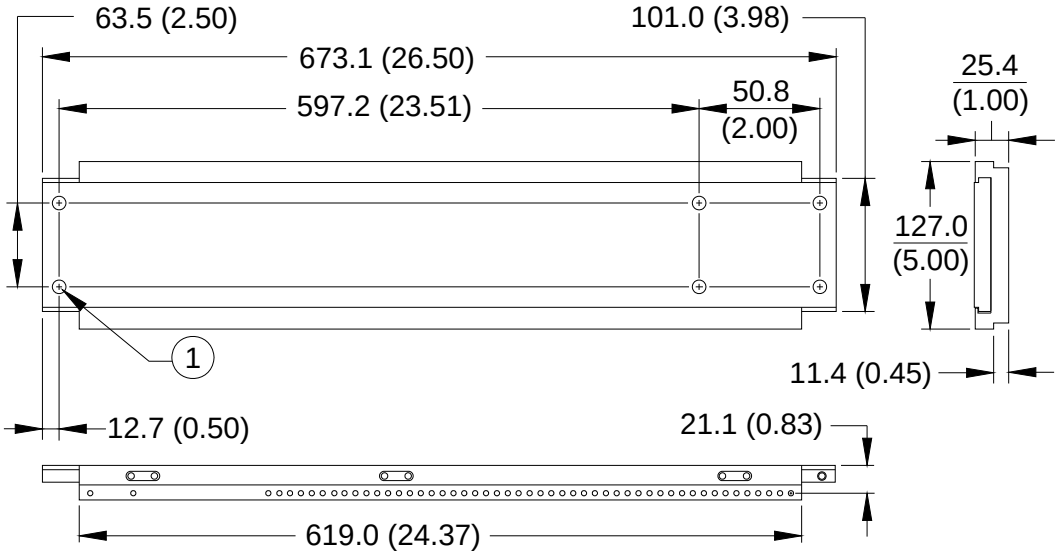
(1) 10(0.40) diameter through, 15 (0.61) counterbore typical

Figure 15 131071-01 Single Transducer Mounting Bracket



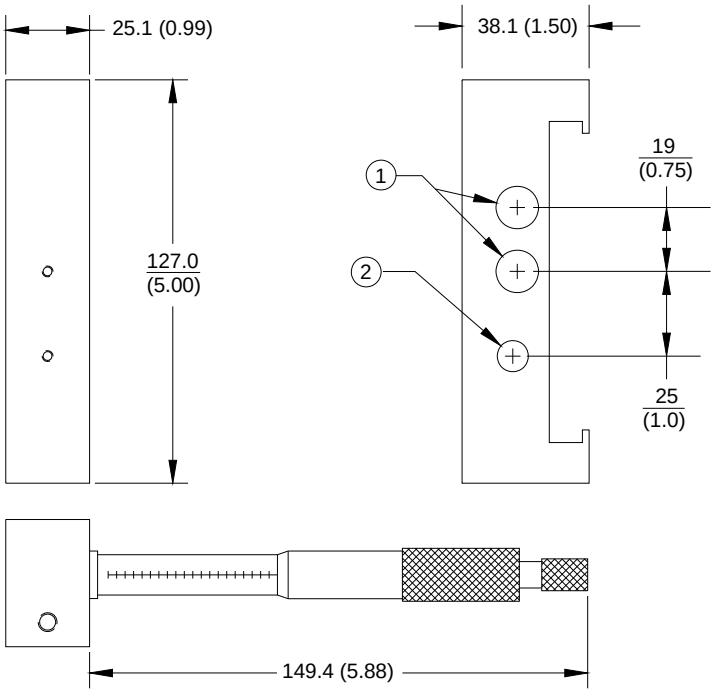
(1) 10(0.40) diameter through, 15 (0.61) counterbore typical

Figure 16 131030-01 Short Complementary Input Differential Expansion (CIDE) Mounting Bracket



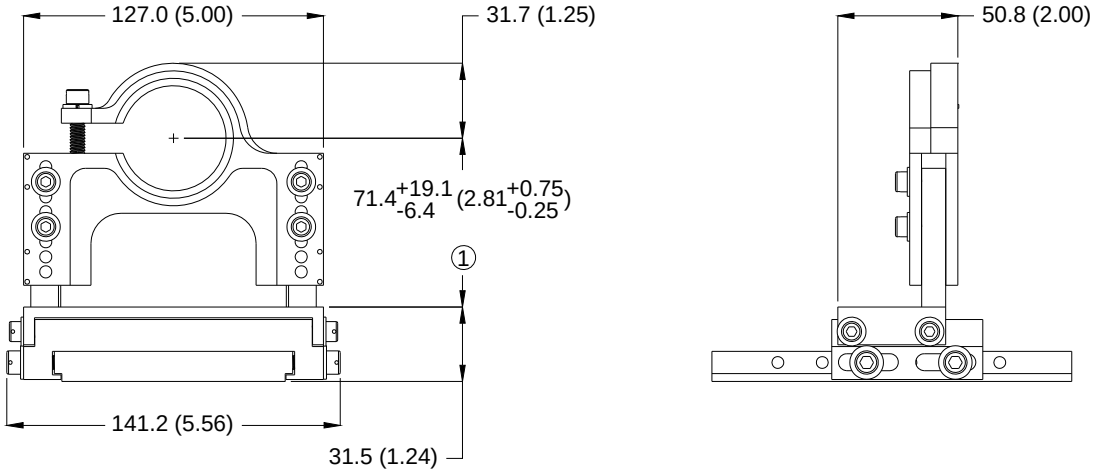
(1) 10 (0.40) diameter through, 15 (0.61) counterbore typical

Figure 17 131031-01 Long Complementary Input Differential Expansion (CIDE) Mounting Bracket



(1) 12.7 (0.5) diameter, 2 places
(2) 9.5 (0.37) diameter

Figure 18 131036-01 and 131036-02 Verification Kit Spindle Micrometer



(1) Vertical adjustments in ¼" increments

Figure 19 330879 Probe Clamp (330879-01-01 Shown)

Note: All dimensions on figures are in millimeters (inches) unless otherwise specified.

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